TIME VALUE OF MONEY

CLASS ASSIGNMENT 1

Formula to be used -

$$FV = A \times (1+r)^n$$

or, $= A \times FVIF_{k,n}$

A → amount deposited

$FVIF_{k,n}$ → future value interest factors for Re 1 compounded at k percent for n periods

FV = Rs 1000 × $(1.11)^{10}$ (compounding period = 12 mths)

= Rs 1000 × 2.8394 [using the tables provided]

= Rs 2839.4

Compounding Period = 6 mths

Rate of interest (p.a) = 10%

Deposit Period = 5 yrs

Amt. Deposited = Rs 2000

Considering compounding period,

new rate of interest = 5% {for 6 mths}

new deposit period = 10

FV = Rs 2000 × $(1.05)^{10}$

= Rs 2000 × 1.6289

= Rs 3257.8

1 (C) Following same analogy as in the previous part,

$FV = Rs\ 4000 \times (1.02)^{16}$

$= Rs\ 5491.2$

1 (D) $FV = Rs\ 3000 \times (1.01)^{36}$

$= Rs\ 3000 \times 1.4308$

$= Rs\ 4292.4$

1 (E) $FV = Rs\ 5000 \times (1.02)^{24}$

$= Rs\ 5000 \times 1.6084$

$= Rs\ 8042$

1 (F) $FV = Rs\ 4000 \times (1.04)^{18}$

$= Rs\ 2.0258 \times 4000$

$= Rs\ 8103.2$

2 Formula to be used for calculating annuity generated by the deposit -

$FV = A \times [[(1+k)^n - 1]/k$

$= A \times FVIFA_{k,n}$ { same notations as in Q1 }

$FVIFA_{k,n}$ → Future value Interest factors for Re 1 compounded at k percent for n periods

2 (A) $FV = Rs\ 2000 \times FVIFA_{6,5}$

$= Rs\ 2000 \times 6.1051$

$= Rs\ 12210.2$

2(B) $FV = Rs\ 10000 \times FVIFA_{12,10}$

$= Rs\ 10000 \times 17.549$

$= Rs\ 175490$

2(C) $FV = Rs\ 5000 \times FVIFA_{8,4}$

$= Rs\ 5000 \times 4.506$

$= Rs\ 22530.5$

2(D) $FV = Rs\ 6000 \times FVIFA_{14,12}$

$= Rs\ 6000 \times 27.272$

$= Rs\ 163626$

3 Ammount of equal annual payment to fully amortize the loan -

$L = A \times PVIFA_{k,n}$

L → Loan

A → Annual payment

$PVIFA_{k,n}$ → Present value interest factors for Rel Compounded at k percent for n periods

3 (A) $Rs\ 10000 = A \times PVIFA_{10,4}$

$Rs\ 10000 = A \times 3.1699$

$A = Rs\ 3154.67$

3 (B) $Rs\ 5000 = A \times PVIFA_{8,6}$

$A = \frac{Rs\ 5000}{4.6229} = Rs\ 1072.29$

3 (C) Rs 200,000 = A × PVIFA 9,10

$$A = Rs \frac{200000}{6.4177}$$

$$= Rs\ 31163.81$$

3 (D) Rs 100,000 = A × $PVIFA_{12,12}$

$$A = Rs \frac{100000}{6.1944}$$

$$= Rs\ 16143.61$$

3 (E) Rs 50,000 = A × $PVIFA_{14,5}$

$$A = Rs \frac{50000}{3.4331}$$

$$= Rs\ 14564.10$$

CLASS ASSIGNMENT 2

1 Using, $FV = A \times FVIFA_{k,n}$

FV = sum of money at end of n periods

$FV = Rs\ 10000 \times FVIFA_{9,15}$

$= Rs\ 10000 \times 3.6425$

$= Rs\ 36425$

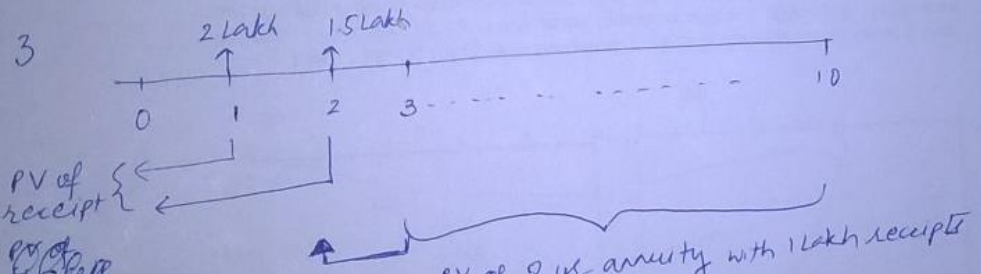
2 $PV = A \times PVIFA_{k,n}$

$PV = Rs\ 1000 \times PVIFA_{10,5}$

$= Rs\ 1000 \times 3.7908$

$= Rs\ 3790.8$

3



PV of Rs 2,00,000 due in 1 year = Rs 200000 × $PVIF_{10,1}$

= Rs 181820 — (1)

PV of Rs 1,50,000 due in 2 year = Rs 150000 × $PVIF_{10,2}$

~~= Rs 58340~~

= Rs 123900 — (2)

PV of 8 yrs annuity at 3rd year = Rs 100000 × PVIFA$_{10,8}$

× = Rs 533490

PV of × at 1st year beginning = Rs 533490 × PVIF$_{10,2}$

= Rs 533490 × 0.8264

= Rs 440876.136 —(3)

⇒ PV of total series is sum of (1), (2), (3) :

= Rs 746596.136

4. Loan Amortization.

$$A = \frac{i \times P \times (1+i)^n}{(1+i)^n - 1}$$

A = instalment
i = rate of interest
P = principal initially borrowed
n = no. of payments

$$A = \frac{0.12 \times 1000000 \times (0.1+0.12)^5}{(1+0.12)^5 - 1}$$

$$= \frac{0.12 \times 1000000 \times 1.7623}{0.7623}$$

$$= \frac{211584}{0.7623} = 277,232.7$$

5. Sinking fund.

$$A = \frac{i \times P}{(1+i)^n - 1}$$

$$= \frac{0.06 \times 500000}{(1+0.06)^{10} - 1}$$

CLASS ASSIGNMENT 3

rate = 12%.

1. a) 100 000

b) PV of 180 000 after 5 yrs

= 180 000 × $PVIF_{12,5}$

= 180 000 × 0.5674

= 102134

c) 11,400 in perpetuity

$PV = \frac{11,400}{0.12} = 95000$

d) 19000 for 10 yrs each.

PV = 19 000 × $PVIFA_{12,10}$

= 19 000 × 5.6502

= 107353.8

e) 6500 in perpetuity, growing at 5%

$PV \quad \frac{6500}{0.12 - 0.05} = 92,857$

best deal → (d).

2. **Deal 1**

Cost of car = 10,00,000

P.V. of annuity =

$$30\,000 \times \left(\frac{1 - \frac{1}{\left(1 - \frac{0.15}{12}\right)^{40}}}{\frac{0.15}{12}} \right)$$

$$= 30\,000 \times \left(\frac{1 - \frac{1}{1.6436}}{0.0125} \right)$$

$$= 30\,000 \times \left(\frac{1 - 0.6084}{0.0125} \right)$$

$$= 30000 \times \left(\frac{0.3916}{0.0125} \right)$$

$$= 30000 \times 31.328$$

$$= 9,39,840$$

PV of deal = 1,00,000 + 9,39,840

= 10,39,840

Deal 2 : 9,00,000 ✓ better deal

3. Every year fuel savings are 22 000, discounted at g% (because fuel prices are rising at g%)
With 12% interest, you can grow your savings.
⇒ Effective rate = (12 − g)%

P. Value of a growing perpetuity

$$= \frac{22080}{0.12 - g/100}$$

This saving should be at least equal to the cost of insulation

$$259000 = \frac{22000}{0.12 - \frac{g}{100}}$$

$$0.12 - \frac{g}{100} = \frac{22000}{259000} = 0.085$$

$$\Rightarrow g = 3.5\%$$

4. PV of Harold's savings :

$= 20\,000 \times PVIFA_{8-5,30}$

$= 20\,000 \times 19.6 = 392\,000$

5. a) Perpetuity decreasing at 4% discount rate 10%.

$PV = \frac{2\,000\,000}{0.10 + 0.04} = 14,285,714$

b) Value after 20 yrs :

$= 2000\,000 \times PVIFA_{10+4,20}$

$= 2\,000\,000 \times 6.6231$

$= 13,246,200$